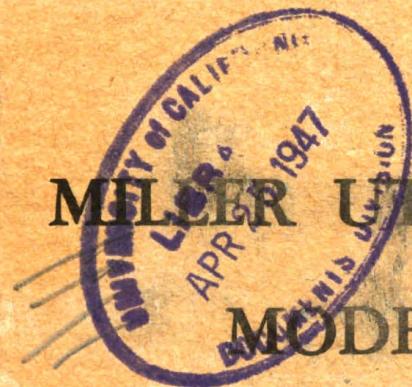


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WAR DEPARTMENT TECHNICAL MANUAL

U.S. Dept. of Army



MLEER UTILITY HEATER
MODEL OG-31-A

WAR DEPARTMENT

30 JUNE 1944

WAR DEPARTMENT TECHNICAL MANUAL
TM 11-2525

MILLER UTILITY HEATER
MODEL OG-31-A



WAR DEPARTMENT

30 JUNE 1944

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WAR DEPARTMENT,
WASHINGTON 25, D. C., 30 June 1944

TM 11-2525, Miller Utility Heater Model OG-31-A, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

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The Adjutant General.

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DESTRUCTION NOTICE

WHY —To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN —When ordered by your commander.

HOW

1. Smash —Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. Cut —Use axes, handaxes, machetes.
3. Burn —Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives —Use firearms, grenades, TNT.
5. Disposal —Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

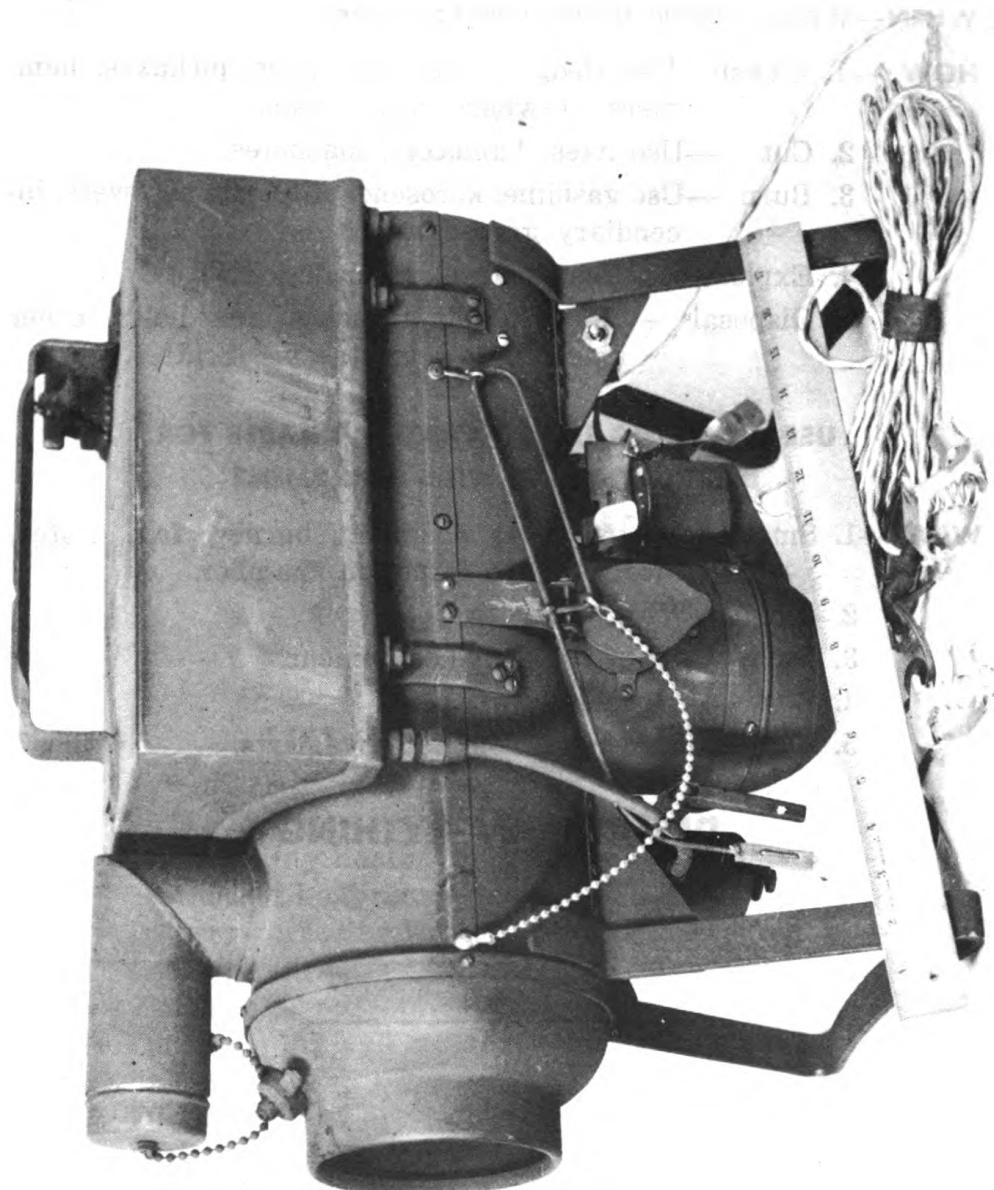
WHAT

1. Smash —Heater, float chamber, burner, fan, motor, levers, and combustion chamber.
2. Cut —Wire leads.
3. Burn —All of the above equipment.
4. Bend —All metal parts.
5. Bury or scatter —All of the above parts.

DESTROY EVERYTHING

SAFETY NOTICE

**Do not attempt at any time to light heater when the heater is hot.
To do so may cause it to explode.**



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Figure 1. Miller utility heater model OG-31-A.

SECTION I

DESCRIPTION

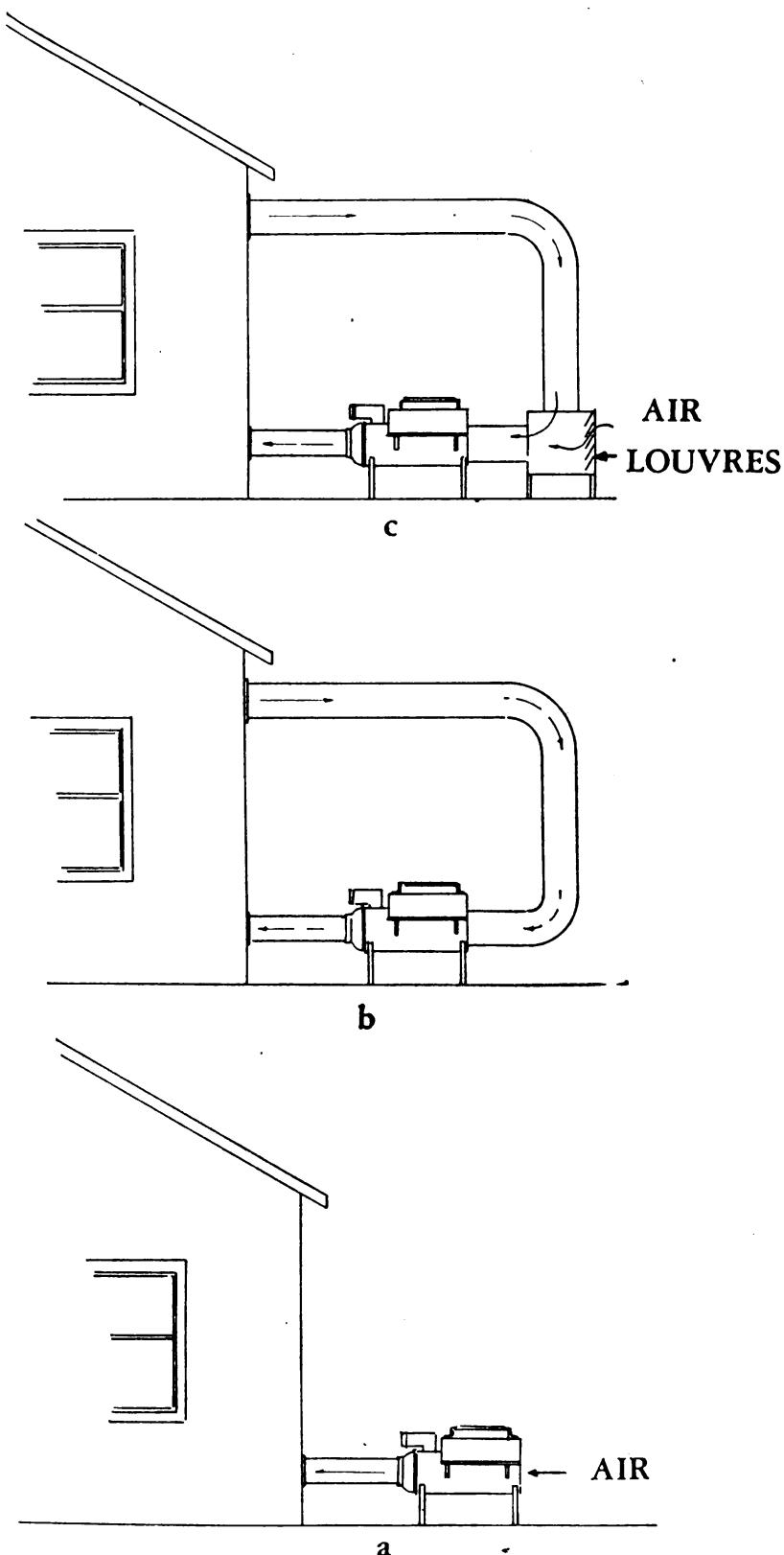
1. GENERAL. Miller utility heater model OG-31-A (fig. 1) can be used for a wide variety of purposes and in a multitude of ways. This heater can be semi-permanently attached to a unit or it can be used as a portable unit. It can be used while equipment is in motion, or it may be carried while burning. When the heater is used on equipment in motion the heater **must** be securely held in place. This heater has the advantage of being able either to separate or to combine the products of combustion and clean, heated air. The maximum Btu output of the heater is obtained by combining the products of combustion with clean, heated air.

2. SPECIFICATIONS.

- a.** Height, $17\frac{1}{2}$ inches.
- b.** Length, 21 inches.
- c.** Width, 9 inches.
- d.** Btu input approximately 40,000.
- e.** Maximum Btu output approximately 39,500 (including contaminated air).
- f.** Btu output, low fire, 8,000 to 10,000.
- g.** Btu output, high fire, approximately 27,000 (clean air).
- h.** Weight, approximately 44 pounds without fuel in fuel tank.
- i.** Current drain on battery from motor driving fan, 2.6 amperes at 12 volts.
- j.** Thermostatically controlled throughout firing range.
- k.** Thermostatically controlled shut-off in case of power failure or over-heating.
- l.** Smoke-pipe outlet, $2\frac{3}{8}$ inches outside diameter.
- m.** Warm-air outlet, 5 inches outside diameter.

3. USING HEATER FOR HEATING SHACKS, SHELTERS, AND CREW COMPARTMENTS (fig. 2).

- a.** When the heater is used for heating small shacks, shelters, tents, etc., and there are people working in the shelter, it is desirable to introduce only clean, heated air into the building and discharge the products of combustion outside the shelters.



TL-91313

b. The heater can best be installed by mounting the heater on the outside of the shelter and directing the clean, heated air into the shelter by means of a flexible or rigid duct [fig. 2(a)].

c. To increase the efficiency in this set-up and to reduce heating time, it may be desirable to recirculate air from the shelter. This can be done by connecting a duct from the rear or fan end of the heater to the shelter [fig. 2(b)].

NOTE: When using a duct for recirculating air care should be taken to make the duct of sufficient size so as not to restrict the free passage of air to the heater. This duct must be at least 6 inches in diameter.

d. A variation of the above recirculation air duct is to install a grille with louvres in the duct. By opening or closing these louvres, the amount of fresh air taken into the shelter can be controlled [fig. 2(c)].

4. USING HEATER FOR PREHEATING INTERNAL-COMBUSTION ENGINES FOR COLD-WEATHER STARTING.

a. For cold-weather starting, the internal-combustion engines must be heated as follows:

(1) Crankcase oil must be heated to a point where it is above zero temperature. This reduces drag.

(2) Water temperature in block must be raised to above zero temperature in order to free pistons.

(3) Carburetor and manifold must be heated to a reasonably high temperature to promote good vaporization of fuel.

(4) Batteries should be heated to as close to 80° F as possible to obtain maximum starting power, hot spark, and to keep the heater operating.

(5) Gear boxes, gears, transfer cases, etc., if lubricated and not disconnected from the drive shaft of the engine, should be heated until oil and grease are fluid or soft.

b. When preheating internal-combustion engines it is necessary to prevent as much heat as possible escaping from the engines. Therefore, all holes and cracks should be sealed up either permanently or temporarily. Special inclosures should be made for the crankcase and battery in order to retain as much heat around these parts as possible. The use of insulating material is recommended.

c. For better performance and quicker starting, prevent heat from escaping and prevent wind and weather from blowing around the engine.

d. The heater can be used as either a stand-by heater or as a quick-start heater. The only limitations are the time factor and the size of the unit to be heated.

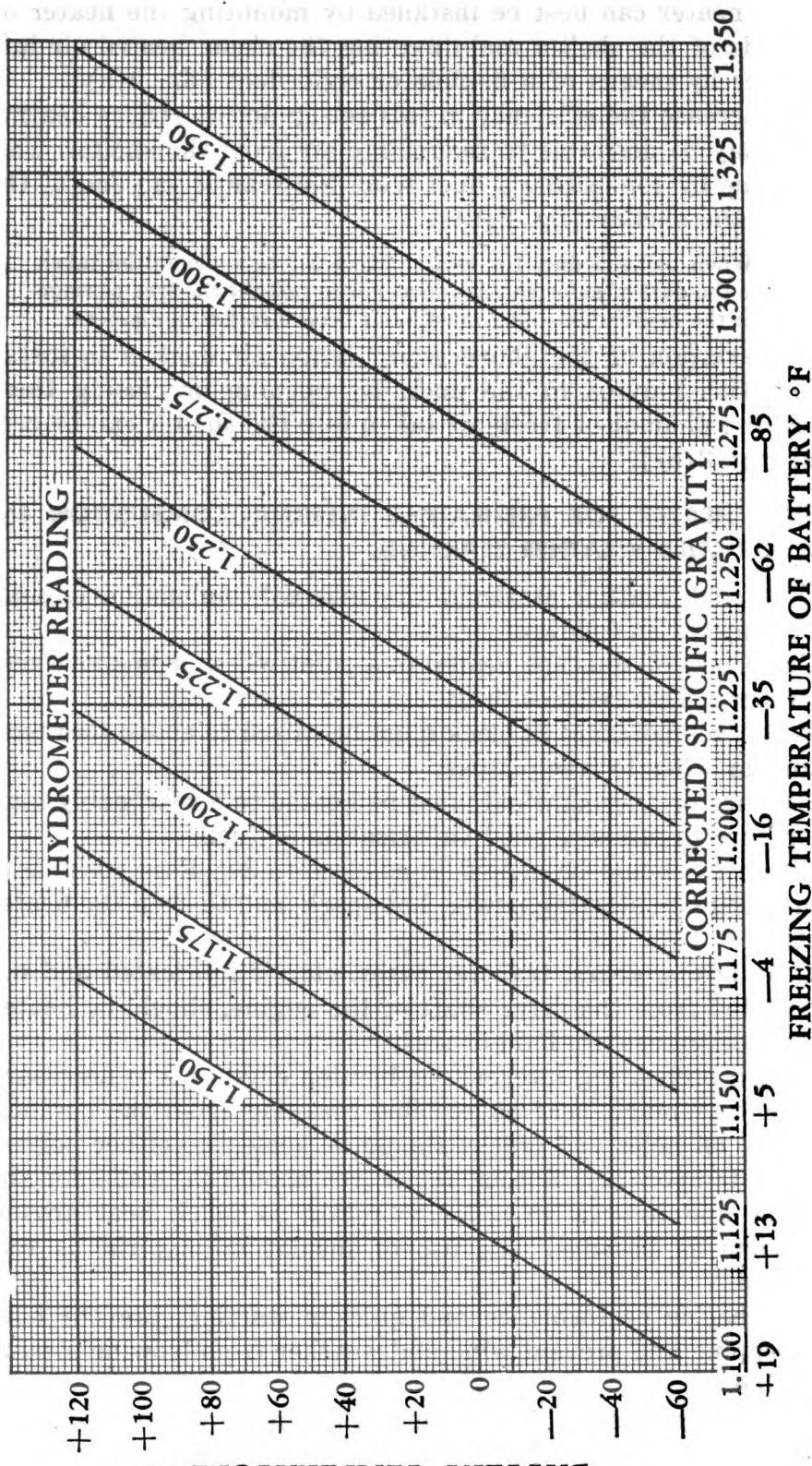


Figure 3. Battery-correction chart.

5. BATTERIES.

a. When batteries are used with the heater keep them as fully charged as possible. This is necessary in order to prevent the batteries from freezing and to insure many hours of uninterrupted heater operation.

b. Figure 3, battery-correction chart, shows the freezing temperature of batteries versus the apparent specific gravity as determined by a hydrometer and the specific gravity corrected for temperature.

c. The following is an explanation of how to use the battery-correction chart (fig. 3).

(1) GENERAL. The figures on the left-hand side of the chart are battery-temperature readings at time of hydrometer reading. The diagonal lines on the chart are the specific gravity readings of the battery as read with a hydrometer. The figures at the bottom of the chart give corrected specific gravity readings of the battery and the freezing temperature at each specific gravity reading.

(2) HOW TO USE CHART. Take temperature and hydrometer reading of battery using the left-hand figure on the chart, follow straight across the correct battery temperature line until you come to the hydrometer reading as taken. Then, at this point, follow straight down to the bottom of the chart and you will find the corrected specific gravity reading and the freezing temperature of the battery.

(3) EXAMPLE. Suppose you are checking a battery and get the following information:

Hydrometer reading	1.250
Battery temperature	-10°F

On left-hand side of chart find the -10°F line. Follow this line across until you come to the hydrometer reading line marked 1.250. From the intersection of the 1.250 line and the -10°F line, follow straight down to bottom of the chart. The corrected specific gravity of the battery is 1.222. Directly underneath this figure, it is shown that the battery will freeze at approximately -32°F .

(4) BATTERY-CORRECTION FACTOR. The battery-correction factor used in determining the above chart follows:

(a) Subtract 0.004 from the hydrometer reading for each 10°F the battery temperature is below 60°F . Add 0.004 to the hydrometer reading for each 10°F the battery temperature is above 60°F .

(b) Example:

Hydrometer reading	1.250
Battery temperature	—10°F
60°F — (—10°F) equals	70°F difference
70°F ÷ 10°F equals	7
7 x 0.004 equals	0.028

$$1.250 - 0.028 = 1.222 \text{ specific gravity corrected to } -10°F$$

6. HEATING BATTERIES. The best way to heat a battery is by directing the heated air across the terminals and connectors on top of the battery. This method heats the terminals and connectors and the heat is conducted into the battery cells through the battery plates. Directing heat against the bottom and sides of the battery is inefficient due to the fact that a battery case is made of an insulating material.

SECTION II

INSTALLATION AND OPERATION

7. GENERAL OPERATING INSTRUCTIONS.

- a. The utility heater model OG-31-A is designed to burn any fuel from 100-octane gasoline to Diesel X.
- b. It has also been designed for extreme cold-weather operation. It has been started and operated successfully at temperatures as low as 60° below zero.
- c. All levers and controls can be operated by a person wearing heavy mittens.
- d. The following list indicates the proper motor voltage to be used with various models of the utility heater model OG-31-A:

Model	Motor
OG-31-A	12-volt dc
OG-31-A-6	6-volt dc
OG-31-A-24	24-volt dc
OG-31-A-32	32-volt dc
OG-31-A-115	115-volt ac

- e. All of the above d-c motors may be used on alternating current when the proper secondary transformers are used as follows:

Model	Secondary transformer (volts ac)
OG-31-A	19.3
OG-31-A-6	11.4
OG-31-A-24	41.0
OG-31-A-32	48.5

8. LIGHTING HEATER (figs. 4 and 5).

NOTE: Do not attempt to light heater when hot.

- a. Unscrew fuel-tank cap (1) and fill fuel tank with proper grade of fuel (par. 7a above).
- b. Connect battery clips (11) on end of extension cord to current supply.
- c. Remove stack plug (3).
- d. Turn motor switch (10) ON.

NOTE: Before proceeding with the following steps, make sure motor comes up to speed.

- e. Push thermostat lever (4) to starting position.

- f. Raise metering-valve lever (9) until it stays in raised position.
- g. Turn on fuel supply to float bowl by pushing in on lever (6).
- h. Turn motor switch (10) OFF.
- i. Remove lighter (12) from holder and insert wick end through lighter door (7) and down into burner bowl.
- j. When end of lighter is moistened with fuel, remove lighter.
- k. Press down on lever (8) to prevent any more fuel from going to burner. This causes metering-valve lever (9) to drop.
- l. Light wick end of lighter (12) and reinsert carefully into burner bowl.

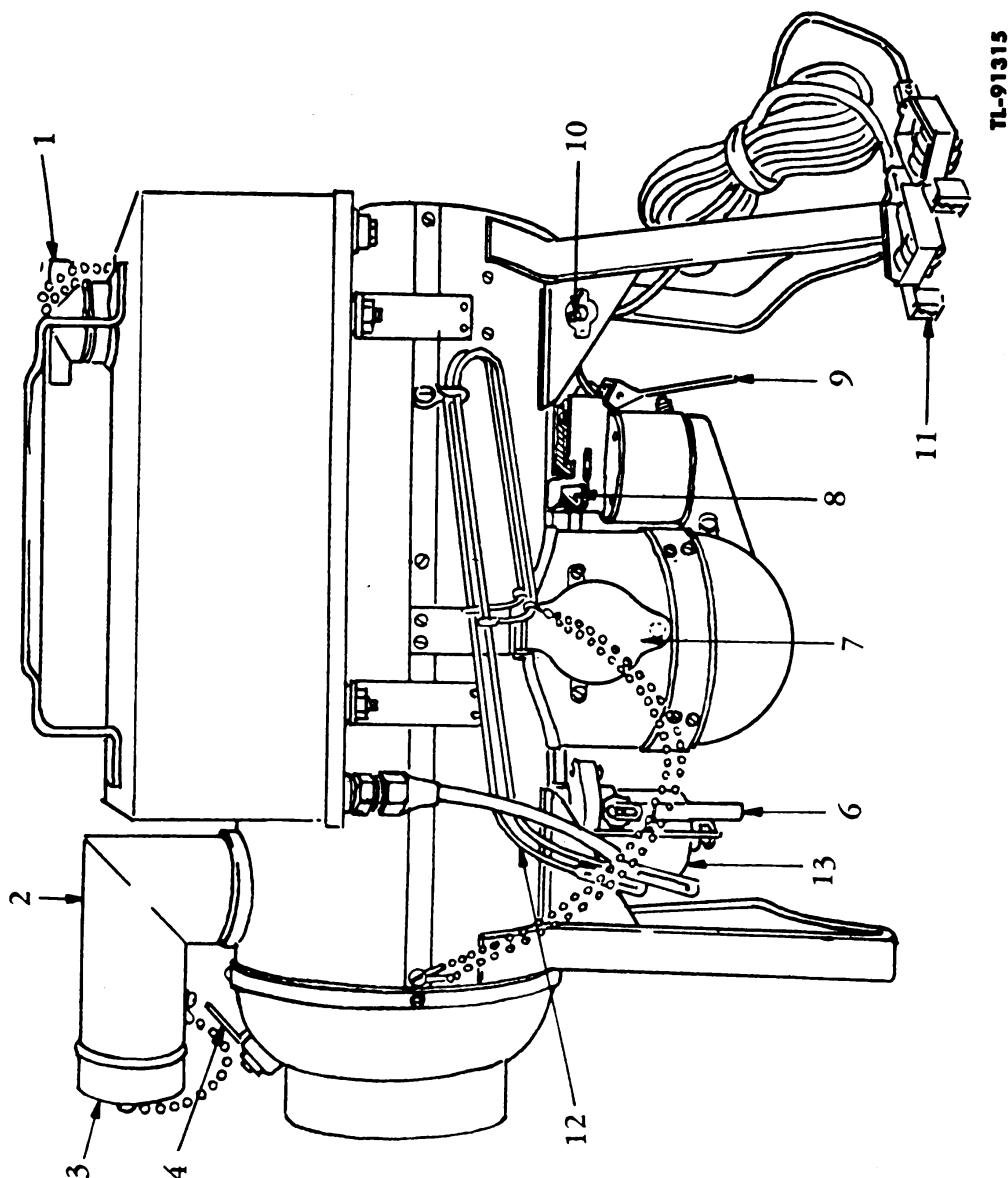


Figure 4. Left side of heater showing controls.

- m. When fuel is burning, turn motor switch (10) ON.
- n. After approximately one minute from time motor is turned on, remove lighter from burner, extinguish, and place back in rack.
- o. Raise metering-valve lever (9) until it stays in raised position.
- p. After 5 minutes of heater operation, turn thermostat lever (4) to No. 5 position.
- q. After 5 minutes more of heater operation, turn thermostat lever to No. 3 position, which is the normal operating position. In extremely low temperatures move thermostat lever to No. 2 or No. 1 position (fig. 5).
- (1) No. 1 position is maximum heater output.
- (2) No. 3 position is medium heater output.
- (3) No. 5 position is minimum heater output.
- r. The heater is now fully adjusted and will operate automatically. The temperature of the heated air is controlled by the thermostat. To increase heater output, move thermostat lever (4) to No. 2 or No. 1 position. To decrease heater output, move thermostat lever to No. 4 or No. 5 position.

9. SHUTTING OFF HEATER (fig. 4). To shut off heater proceed as follows:

- a. Pull out on lever (6).
- b. When burner goes out, push down on lever (8) and the metering-valve lever (9) will then snap down.

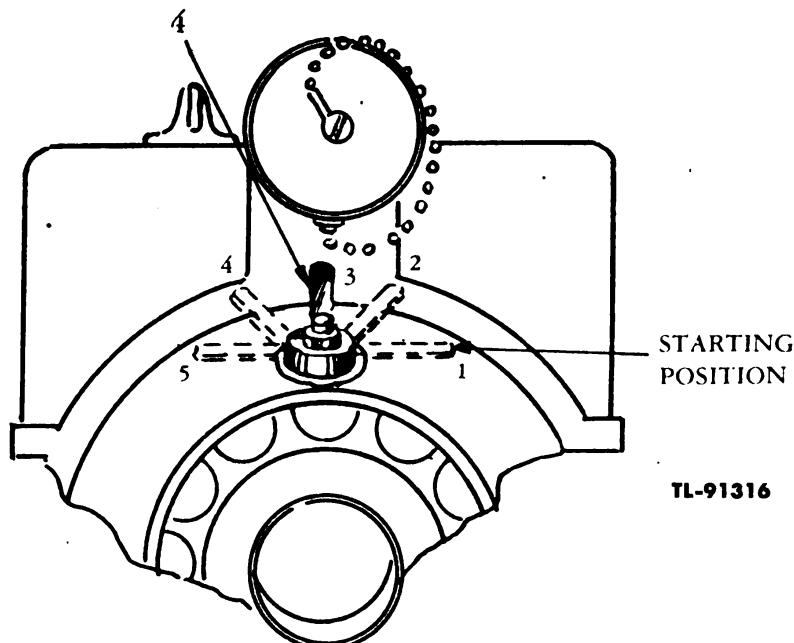


Figure 5. Thermostat adjustments.

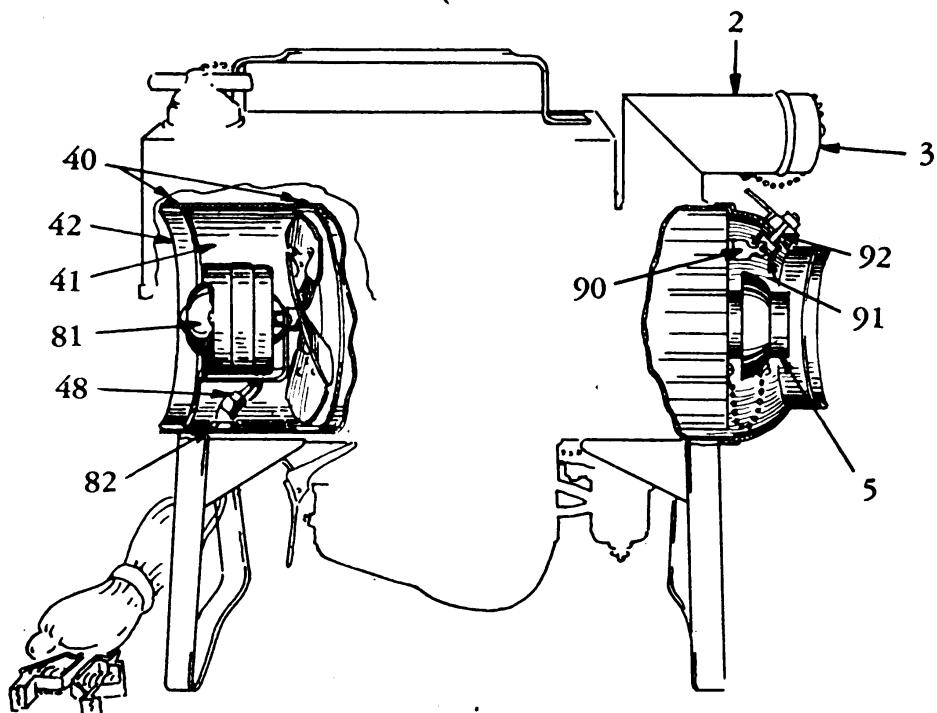


Figure 6. Diffuser plug and motor assemblies.

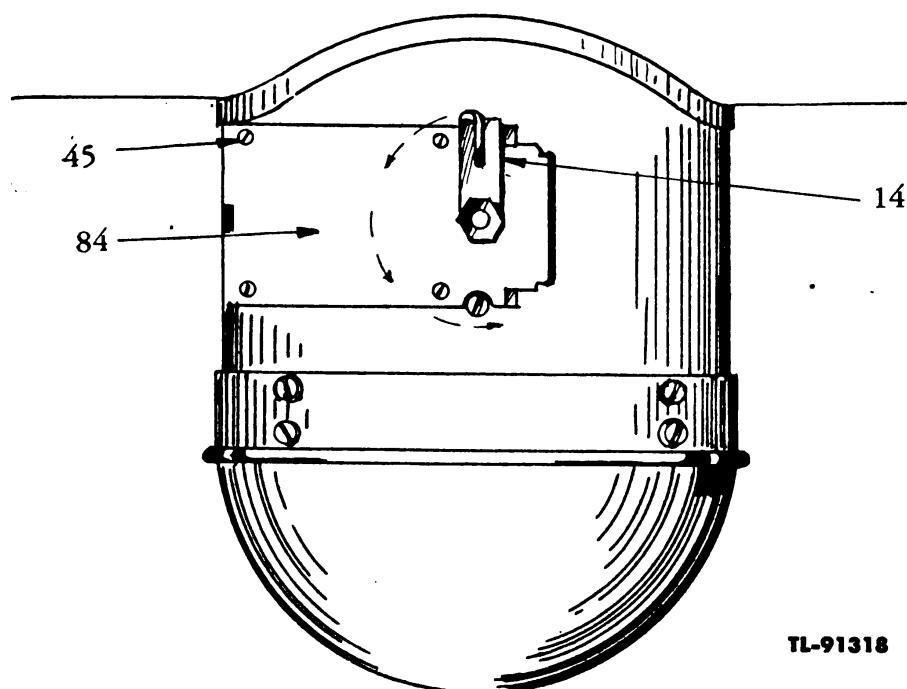


Figure 7. Safety shut-off.

- c. Allow motor to operate for several minutes after burner goes out in order to cool burner.
- d. Turn motor switch (10) OFF.
- e. Disconnect extension cord (11) from battery and wrap extension cord around legs of heater.

10. FOR CLEAN, HEATED AIR (fig. 6). When heater is adjusted to deliver only clean, heated air from the heater outlet, it is suitable for space heating of personnel compartments.

- a. Unplug stack plug (3).
- b. Place diffuser plug (5) in closed position.

11. FOR CONTAMINATED AIR (fig. 6). When heater is adjusted to deliver contaminated air from the heater outlet, the useful heat output of the heater is increased. This is designed primarily for applications where products of combustion would not be harmful.

- a. Place diffuser plug (5) in open position.
- b. Place stack plug (3) into stack (2).

CAUTION: When operating heater, either stack plug or diffuser plug must be in the open position at all times.

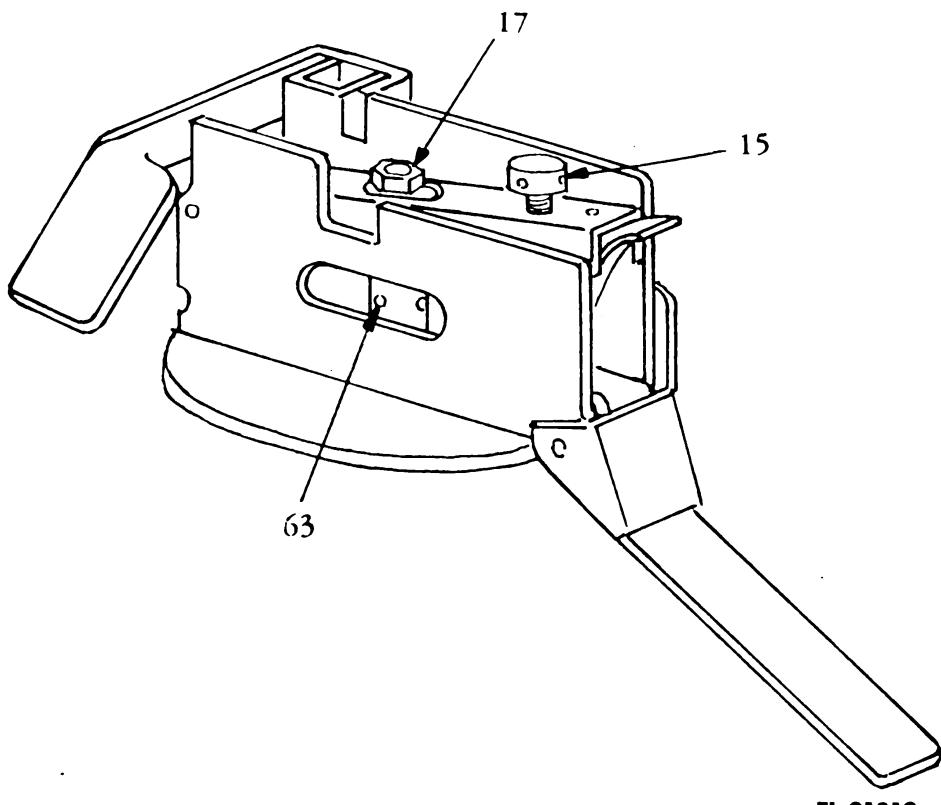


Figure 8. High- and low-fire adjustments.

12. SAFETY SHUT-OFF (figs. 4 and 7). The safety shut-off on the heater is a safety device used to prevent the heater from being damaged by excessive heat caused by motor failure, obstruction over air outlet, obstruction over air inlet, or for any other reason. The safety shut-off lever operates by temperature, and when the temperature becomes too great, it acts to release lever (8) and cause metering-valve lever (9) to snap closed and shut off all fuel going to burner. When this occurs, it is necessary to allow heater to cool, determine and correct condition which caused safety shut-off to operate, and then relight burner as described in paragraph 8 above.

- a.** For low outside temperature, turn safety shut-off adjusting lever (14) to upper position.
- b.** For high outside or inside temperature, turn safety shut-off adjusting lever to lower position.

13. ADJUSTING HIGH FIRE (figs. 5 and 8). The high fire on the heater is factory adjusted and calibrated and should not require any further adjustment in the field. However, upon rare occasions when it may be necessary to adjust the high fire, proceed as follows:

- a.** Light heater and allow heater to operate for about 15 minutes with the thermostat (4) set at No. 3 position.
- b.** Turn thermostat lever to No. 1 position to bring burner to high fire.
- c.** Insert a small nail or stiff wire into the high-fire adjusting screw (15).
- d.** Increase high fire by turning this screw counterclockwise.
- e.** Decrease high fire by turning this screw clockwise.
- f.** The high-fire adjusting screw should only be turned a little at a time.
- g.** The high fire should be adjusted so that no smoke is visible from stack.

14. ADJUSTING LOW FIRE (figs. 5, 8, and 11). The low fire of the heater is factory adjusted and should not require any further adjustment in the field. However, upon rare occasions when it may be necessary to adjust the low fire, proceed as follows:

- a.** Light heater and allow heater to operate for about 15 minutes with the thermostat lever (4) set at No. 3 position.
- b.** Then turn thermostat lever to No. 5 position to bring burner to the low-pilot position.
- c.** Insert a small nail or stiff wire into the small hole in the metering valve (63) to keep metering valve from turning.

- d. Place a small open-end wrench on the low-fire adjusting nut (17).
- e. Increase the low fire by turning this adjusting nut clockwise.
- f. Decrease the low fire by turning this adjusting nut counter-clockwise.
- g. The low-fire adjusting nut should only be turned a little at a time.
- h. The low fire should be adjusted so that top of flame just touches flame spreader (57) in burner.

SECTION III

FUNCTIONING OF PARTS

15. OPERATION OF HEATER.

a. Motor and Fan.

(1) The motor and fan of the heater have a dual function. When the motor is connected to the correct power supply lines, it causes the fan to rotate. This rotation blows air around the combustion chamber of the heater, and through the nine tubes. This air, in passing around the combustion chamber, absorbs heat from the combustion chamber and emerges from the heater nose as heated air.

(2) A small amount of the air from the fan is by-passed from around the outside of the combustion chamber [subpar. (1) above] and is led down to the burner. This air is supplied to the burner in such a manner that it completely burns the fuel being supplied to the burner. This air then becomes part of the products of combustion, and after being directed into the combustion chamber, emerges through either the stack opening or the diffuser opening.

b. Combustion Process. The supply reservoir for fuel for the heater is in the form of a fuel tank located on top of the heater. There are two fuel lines leading out of the tank. They are located in diametrically opposite corners. This is necessary in order to insure a sufficient fuel supply to the burner if the burner is off level. These two fuel lines meet in a common sump. Here the fuel is strained before being allowed to pass through a shut-off valve to the float chamber. The fuel entering the float chamber is controlled by means of a float connected to a small needle valve. The construction is similar to an automobile carburetor. The fuel in the float chamber is allowed to pass from the float chamber to the burner proper through a drilled oil line. The amount of fuel allowed to flow to the burner is controlled by a metering valve. Once the fuel is in the burner, air and heat are applied in sufficient amounts to allow the fuel to burn. The fuel, upon being burned, is passed through the combustion chamber and out the stack opening or diffuser opening as part of the products of combustion.

c. Thermostatic Control. The thermostatic control is a temperature-responsive device which controls the heat output of the heater. The thermostatic element is a combination of three pieces of helix

bimetal, connected in series, and is located in the top tube of the combustion chamber. The forward end of this thermostat is connected to an adjusting lever. The rear end of the thermostat is connected to a crank arrangement which in turn is connected to a series of levers which operate the metering valve. In operation the cycle of operation of the thermostat is as follows:

(1) The thermostat adjusting lever is pushed to the starting position which is at the maximum tension position of the bimetal helix. This permits the metering valve to open to the high-pilot position.

(2) After the burner is lighted it is allowed to burn for several minutes in order to allow the heater to become thoroughly heated.

(3) The thermostat lever is then pushed to the extreme opposite position which is the minimum tension position of the bimetal helix. At this point the temperature of the thermostat is high enough to cause the helix coil to rotate. When it rotates, it causes the crank mechanism to turn, which raises the levers holding the metering valve in the pilot position. This allows more fuel to enter burner, causing a higher temperature on the thermostat and allowing more oil to enter the burner. This continues until crank mechanism is in the extreme raised position allowing full high fire in heater. At this particular point the heat in the thermostat is still enough to cause the thermostat to rotate. This time, however, the crank mechanism is beyond its highest point and is now going downward causing the levers to start to close the metering valve.

(4) The metering valve, now being partially closed, reduces the fuel going to the burner. The reduction in fuel to the burner results in a smaller flame in the burner and a consequent reduction in temperature in the thermostat.

(5) The reduction in temperature of the thermostat causes the bimetal helix to rotate in the opposite direction, thereby allowing the metering valve to open a little more.

(6) During the entire operation of the heater, the thermostat is constantly rotating first one way and then the other way, which causes the metering valve to move towards the open position and then to the closed position. The continuous modulation of the metering valve allows any ice crystals that might form around the metering valve to flow through to the burner where the heat melts them and they pass off as harmless water vapor.

d. Eliminating Radio-frequency Interference.

(1) GENERAL. The motor of utility heater OG-31-A is so constructed as to eliminate radio interference. It is equipped with capacitors and suppressors. The extension cord connecting the

motor with the power source is shielded with a woven metallic covering to eliminate any leakage through the cable.

NOTE: Some models of Miller utility heater OG-31-A are not equipped with this shielding. It is recommended that only shielded heaters be used in the vicinity of radio receivers and transmitters.

(2) PARTS. (a) *Capacitor.* The 0.1-mf capacitor is mounted on the heater frame and is connected to the load side of the heater motor toggle switch.

(b) *Bonding Jumpers.* Bonding jumpers connect the motor to the frame, and the right front supporting leg to the base.

(c) *Bonding of Mechanical Parts.* The mechanical parts are bonded by tooth-type lockwashers which connect the heater mounting base to the platform at the rear of the heater, and the capacitor mounting bracket to the heater frame.

(d) *Wire Shielding.* The tinned copper braid, which is the woven metallic covering for the cable, connects the ungrounded power lead of the heater motor to the toggle switch, and the heater toggle switch lead to the power source.

SECTION IV

MAINTENANCE

NOTE: Unsatisfactory performance of this equipment will be reported immediately on W. D., A. G. O. Form No. 468. If form is not available, see TM 38-250.

16. HEATER DISASSEMBLY (figs. 6, 7, 9, and 10).

- a. To disassemble heater, proceed as follows:
 - (1) Loosen nut (18) holding copper tube (19) in place on float bowl.
 - (2) Remove four screws (20) holding burner cover (21) in place.
 - (3) Remove burner cover (21) by pulling downward.
 - (4) Remove two bolts (23).
 - (5) Remove two studs (22).
 - (6) Remove burner and float bowl assembly by pulling downward.
 - (7) Loosen nut (24) holding copper tube (19) in place on sump.
 - (8) Remove copper tube (27) by loosening nuts (25) and (26).
 - (9) Remove copper tube (28) by loosening nuts (29) and (30).
 - (10) Remove two screws (31) and sump assembly (13) will come loose.
 - (11) Remove two screws (32) and lighter door assembly (33) can be removed by pulling out.
 - (12) Remove two screws (34) and lighter door spring (35) will come loose.
 - (13) Remove four nuts (36) and remove fuel tank (37) by pulling upward.
 - (14) Remove stack (2) by pulling upward.
 - (15) Remove four screws (38) and heater nosepiece (39) can be removed.
 - (16) Remove two screws (40) holding upper housings (41) to two rings (42).
 - (17) Remove ten screws (43) holding upper housing assembly (41) to lower housing assembly (44).
 - (18) Remove four screws (45) and safety shut-off (84) can be removed by pulling out.
 - (19) Remove four screws (46) holding housing support ring (47) in place.
 - (20) Remove combustion drum assembly by lifting upward.
 - (21) Remove the two support rings (42) by lifting out.
 - (22) Disconnect the two lead wires (48) from motor.
 - (23) Remove four screws (49) and motor assembly can be removed.

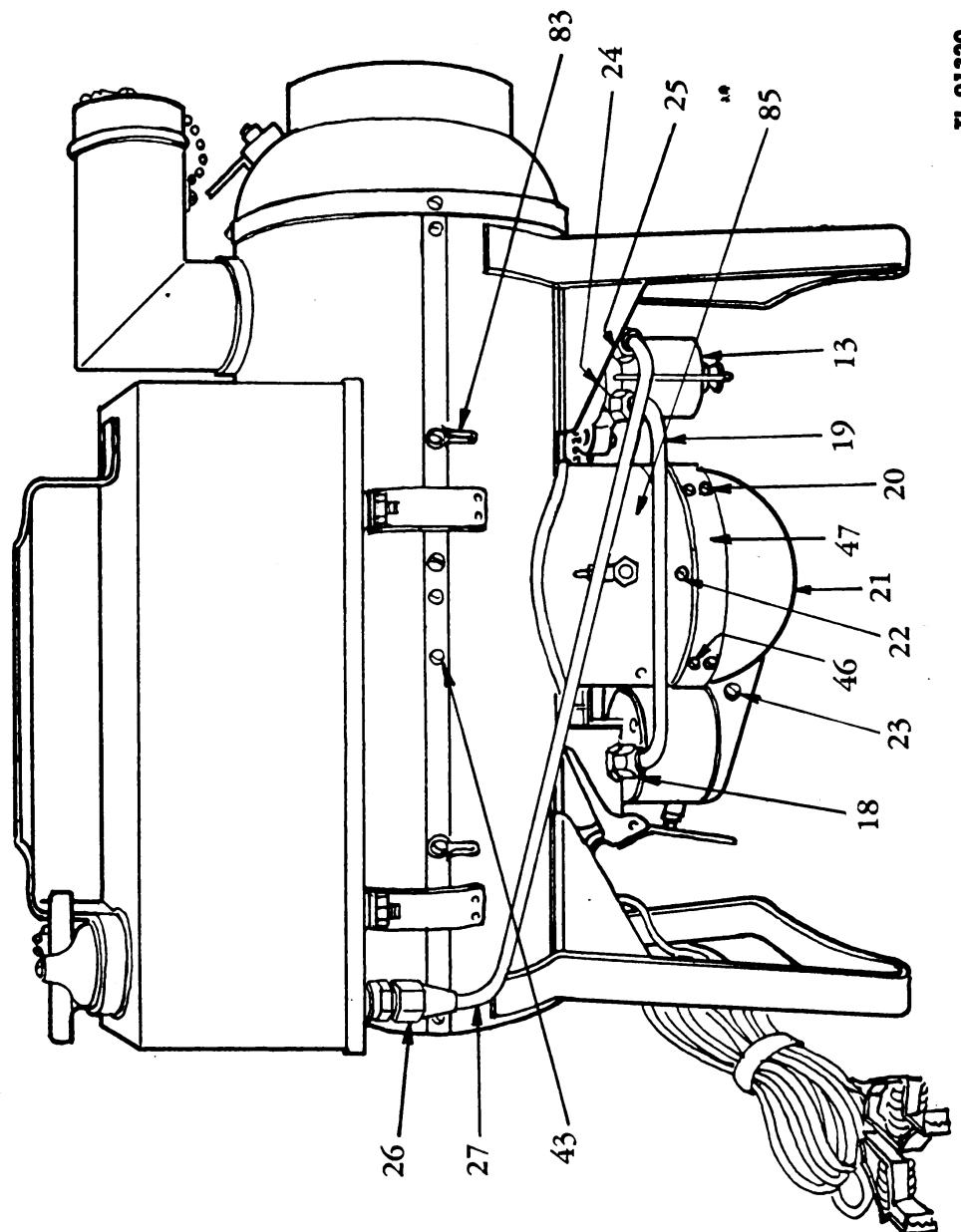


Figure 9. Right side of heater.

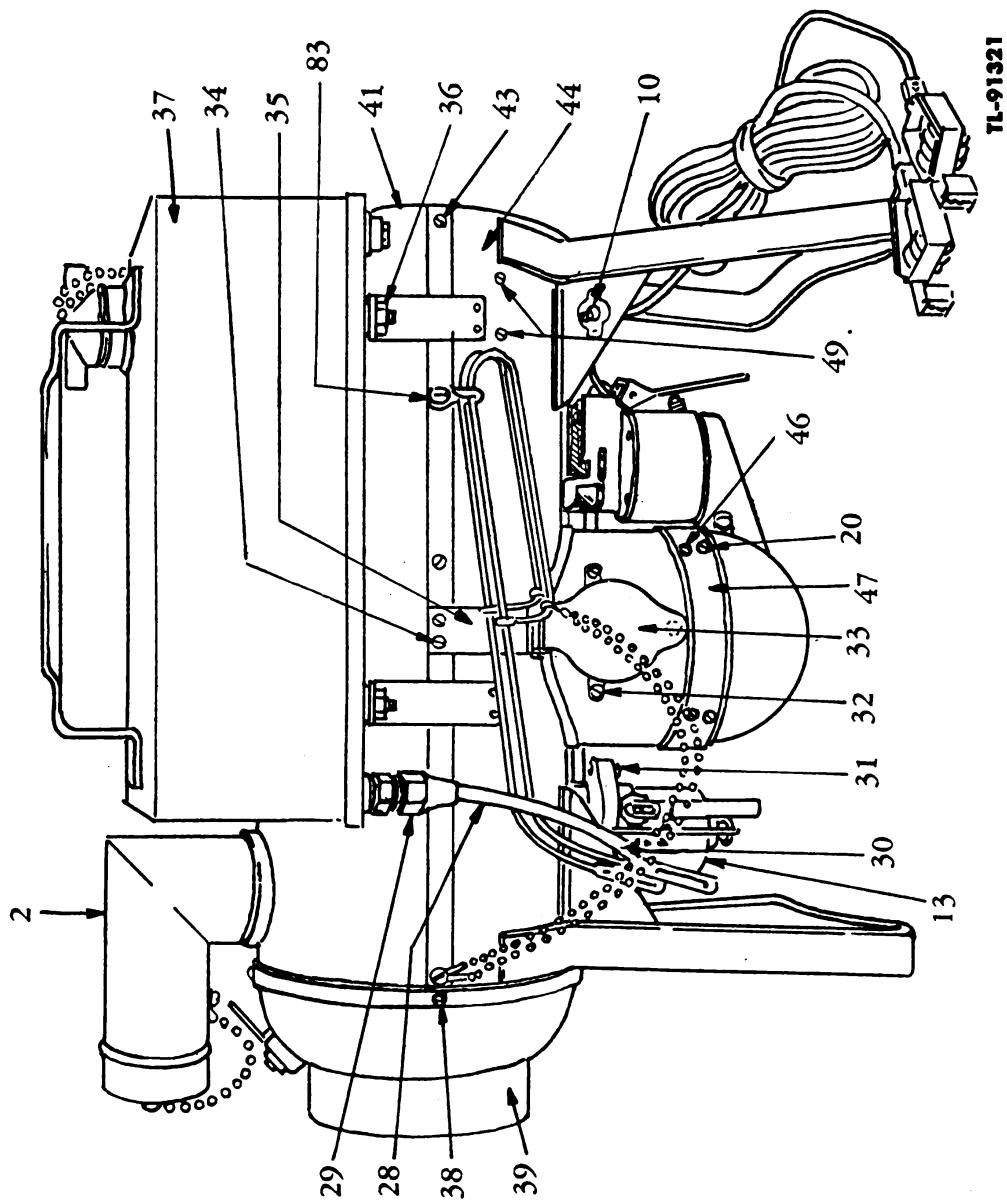


Figure 10. Left side of heater.

b. The heater is now completely disassembled into its various subassemblies. To take these subassemblies apart, proceed as indicated in the following instructions.

17. BURNER DISASSEMBLY (fig. 11). To take burner apart, proceed as follows:

- a.** Remove burner [par. 16a(1) to (6)].
- b.** Remove three bolts (50) holding burner together.
- c.** Remove top ring assembly (51) by lifting off.
- d.** Remove perforated sleeve (52) by lifting off.
- e.** Remove central air distributor (53) by pulling upward.
- f.** Remove lock nut (54) and vaporizer cover (55) will come loose.
- g.** Remove pipe plug (56).
- h.** Clean all holes in top ring, perforated sleeve, and vaporizer. Remove any carbon or lead accumulation on all parts.
- i.** Check drilled oil line to burner making sure it is clean.

18. BURNER ASSEMBLY (fig. 11). To assemble burner, proceed as follows:

- a.** Replace pipe plug (56) making sure threads are covered with a good grade of pipe dope.
- b.** Put central air distributor (53) in place making sure it is firmly down on boss of vaporizer (58).
- c.** Place perforated sleeve (52) in machined groove in vaporizer (59) making sure small closely spaced holes are facing downward and the large holes are facing upward.
- d.** Place top ring assembly (51) on perforated sleeve (52) making sure perforated sleeve fits into machined groove in top ring casting.
- e.** Turn top ring assembly (51) until the two side holes are directly on the side of the burner, and the three bolt holes line up with the three tapped holes in the vaporizer (59).
- f.** Insert three bolts (50) through the three holes in top ring (51) and screw them firmly and evenly into the three tapped holes in the vaporizer (59).
- g.** Replace vaporizer cover (55) and fasten securely with lock nut (54).
- h.** Reinsert burner into heater [par. 27a (17) to (22)] and [par. 27a (31)].

19. FLOAT CHAMBER DISASSEMBLY (fig. 12). To take float chamber apart, proceed as follows:

- a.** Remove burner from heater [par. 16a(1) to (6)].
- b.** Remove four screws (60) holding lever assembly (61) to float chamber (62).

c. Lift off float-valve cover of lever assembly (61). Metering valve (63) will come out with float-valve cover.

NOTE: The metering valve fits loosely in float-valve cover. Care should be taken when removing this assembly to make sure metering valve does not drop.

d. Remove metering valve (63) from float-valve cover of lever assembly (61) by sliding it out through the bottom.

e. Remove coil spring (64) from metering valve (63).

f. Check metering valve and clean thoroughly with a piece of soft wood. Make sure metering slot is clean. Wash thoroughly in gasoline, kerosene, carbon tetrachloride, or dry-cleaning solvent.

g. Remove pin (65) holding float (66) in place.

h. Remove two screws (67) holding bronze spring (68) in place.

i. Needle valve (69) can then be removed by allowing it to drop in the hand.

NOTE: Care should be taken in handling the needle valve, as any injury to this part will make it unfit for further use.

j. Check needle valve carefully and clean off any stains or gum with a piece of very soft wood or cork. Wash thoroughly in gasoline, kerosene, carbon tetrachloride, or dry-cleaning solvent.

k. Remove rivet (70) by allowing it to drop out into the hand.

l. Clean rivet thoroughly and wash in gasoline, kerosene, carbon tetrachloride, or dry-cleaning solvent.

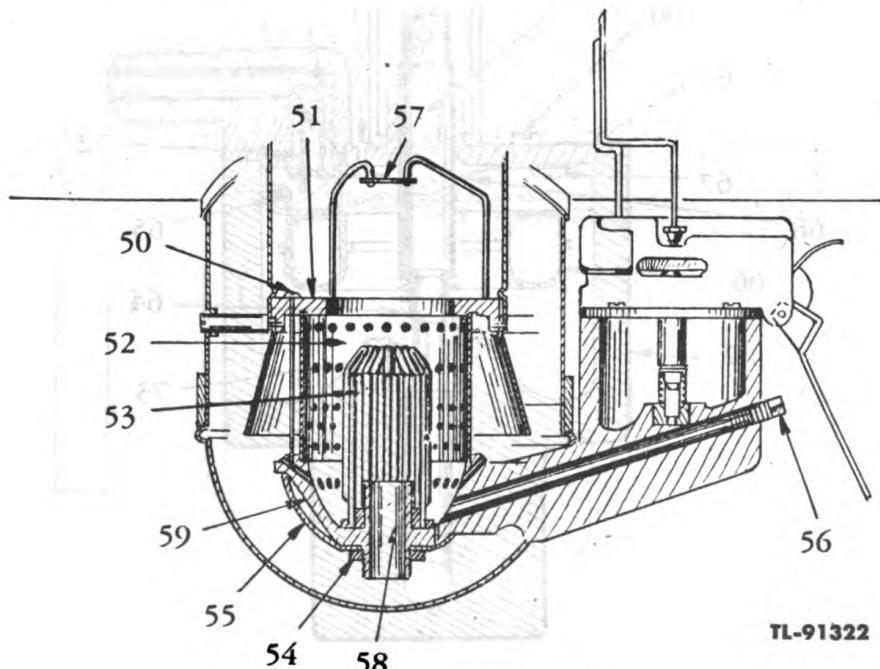


Figure 11. Burner assembly.

m. Needle-valve seat (71) can be removed by unscrewing with a screwdriver. Use proper size screwdriver so as not to burr valve seat.

n. Check needle-valve seat. Clean thoroughly with a piece of soft wood. Wash thoroughly with gasoline, kerosene, carbon tetrachloride, or dry-cleaning solvent.

o. Check needle-valve seat gasket (72) and make sure it is in good condition. If not, replace with a new gasket.

NOTE: Do not use any metal or abrasives when cleaning metering valve, needle valve, or needle-valve seat. To do so may damage them to such an extent that their respective functions will be impaired.

20. FLOAT CHAMBER ASSEMBLY (fig. 12). To assemble float chamber, proceed as follows:

a. Screw needle-valve seat (71) into lever assembly (61) making sure gasket (72) is in place. Tighten securely.

b. Insert needle valve (69) into needle-valve seat (71).

c. Replace rivet (70) in valve cover, making sure rivet head is on underneath-side of valve cover.

d. Replace bronze spring (68) and fasten securely with two screws (67).

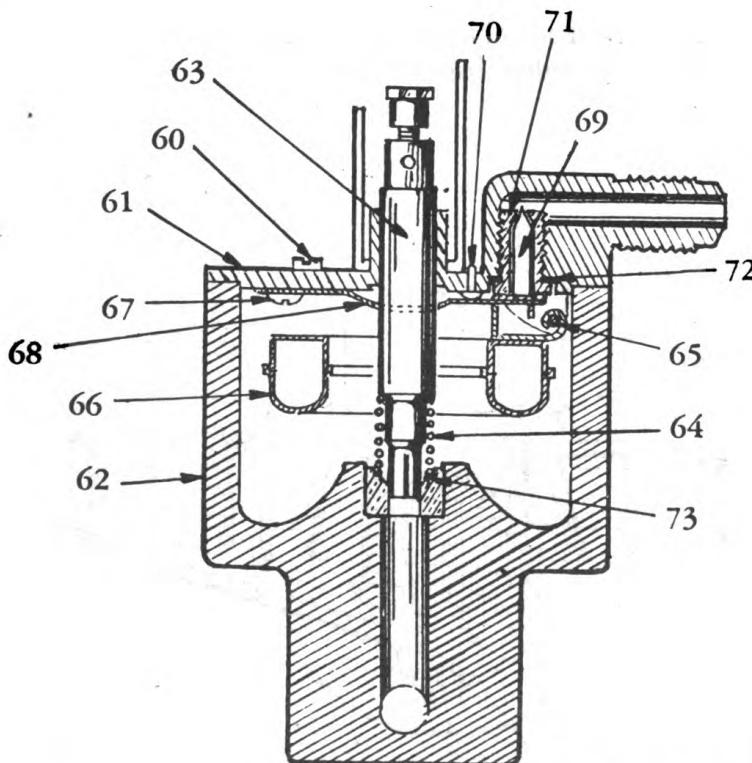
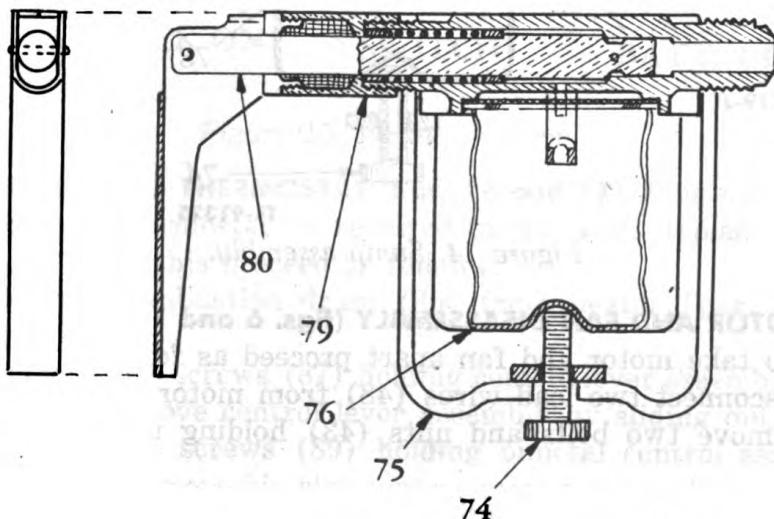


Figure 12. Float chamber assembly.

- e. Place float (66) into position by pushing up on bronze spring (68).
- f. Replace pin (65) holding float in position.
- g. Place coil spring (64) on metering valve (63) making sure it is firmly in place in groove on metering valve.
- h. Insert metering valve (63) through center hole in float-valve cover of lever assembly (61) from under side.
- i. Place float-valve cover of lever assembly (61) on float chamber (62) making sure metering valve spring (64) is located in the small depression in the float-chamber boss (73).
- j. Insert four screws (60) through the four holes in the float-valve cover of lever assembly (61) and tighten firmly and evenly.
- k. Reinsert burner into heater [par. 27a(17) to (22) and (31)].

21. SUMP DISASSEMBLY (figs. 13 and 14). To take sump apart, proceed as follows:

- a. Empty fuel tank.
- b. Loosen sump screw (74).
- c. Swing sump wire (75) to one side.
- d. Remove sump bowl (76) by pulling downward.
- e. Clean sump bowl (76) thoroughly removing all dirt, water, etc. Wash thoroughly in gasoline, kerosene, carbon tetrachloride, or dry-cleaning solvent.
- f. Remove cork gasket (77) by pulling loose.
- g. Remove strainer (78) by working loose.
- h. Clean strainer (78) thoroughly of all dirt, wax, lint, etc., by washing in gasoline, kerosene, carbon tetrachloride, or dry-cleaning solvent.



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Figure 13. Shut-off valve assembly.

i. Loosen shut-off valve nut (79) and remove shut-off valve (80). Clean valve thoroughly with a piece of soft wood. Wash carefully in gasoline, kerosene, carbon tetrachloride, or dry-cleaning solvent.

NOTE: It is not recommended that this valve assembly be taken apart except as noted in subparagraph i above. If valve is damaged, replace with a new unit.

22. SUMP ASSEMBLY (figs. 13 and 14). To assemble sump proceed as follows:

- a. Insert shut-off valve (80) in place and tighten nut (79) securely.
- b. Insert strainer (78) in place.
- c. Replace cork gasket (77). If gasket is broken, cracked, or deeply grooved, replace with a new gasket.
- d. Replace sump bowl (76) and hold in place by swinging bale wire (75) into position and tightening sump screw (74).

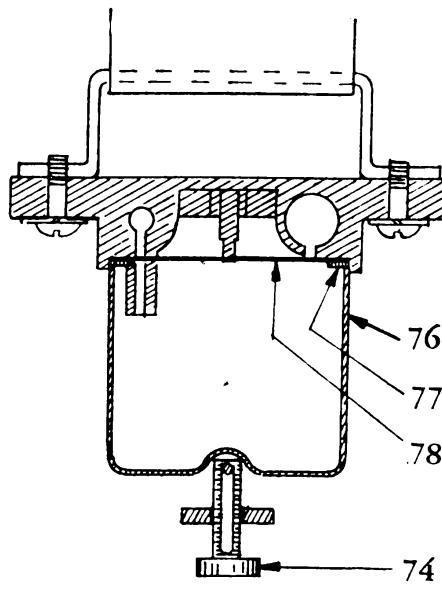


Figure 14. Sump assembly.

23. MOTOR AND FAN DISASSEMBLY (figs. 6 and 10).

- a. To take motor and fan apart proceed as follows:
 - (1) Disconnect two lead wires (48) from motor (81).
 - (2) Remove two bolts and nuts (43) holding rear of motor in place.
 - (3) Remove four screws (49) holding front of motor in place.
 - (4) Motor (81) can then be removed by pulling through the rear opening.

(5) Unloosen set screw in fan hub and fan can be removed from motor shaft.

(6) Clean motor and fan thoroughly, removing all dirt, dust, and lint.

b. It is not recommended that the motor be taken apart, except as described above. Do not oil motor at any time. The motor bearings have their own, self contained, special, low-temperature lubricant.

24. MOTOR AND FAN ASSEMBLY. To assemble motor and fan proceed as follows:

a. Slide fan assembly on motor shaft and tighten set screw.

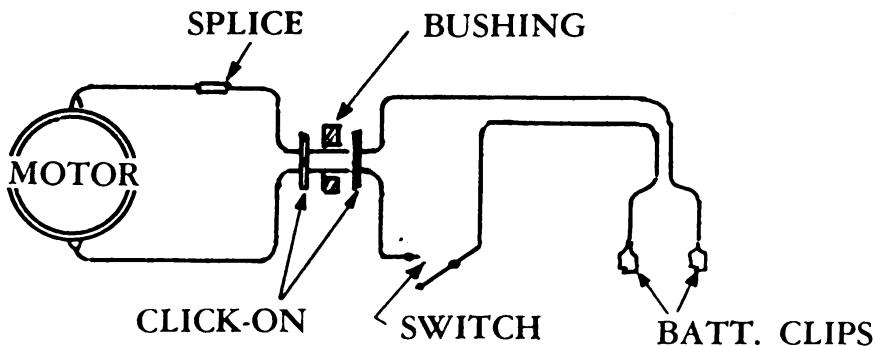
NOTE: When placing fan on motor shaft, make sure that end of hub which has set screw, is facing towards motor. Fan hub should be approximately flush with end of motor shaft.

b. Insert motor and fan assembly through rear opening of heater.

c. Replace four screws (49) making sure they are tight.

d. Replace two bolts and nuts (43) holding rear of motor in place.

e. Reconnect lead wires (48) from motor (fig. 15).



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Figure 15. Wiring diagram.

25. REMOVING THERMOSTAT (figs. 16 and 17). It is not recommended that thermostat be repaired in the field. Replace with a new unit. To do this proceed as follows:

a. Remove combustion drum (86) from heater [par. 16a(1) to (20)].

b. Remove two screws (87) holding control lever assembly (88) in place and remove control lever assembly by sliding out.

c. Remove two screws (89) holding bimetal control assembly (90) in place. Remove bimetal control assembly by sliding out.

26. REPLACING THERMOSTAT (figs. 16 and 17). To replace thermostat, proceed as follows:

- a.** Insert control lever assembly (88) into rear of top tube of combustion drum (86).
- b.** Fasten in place with two screws and lockwashers (87).
- c.** Insert bimetal control assembly (90) in front end of top tube of combustion drum (86).
- d.** Fasten bimetal control assembly (90) in place with two screws (89).

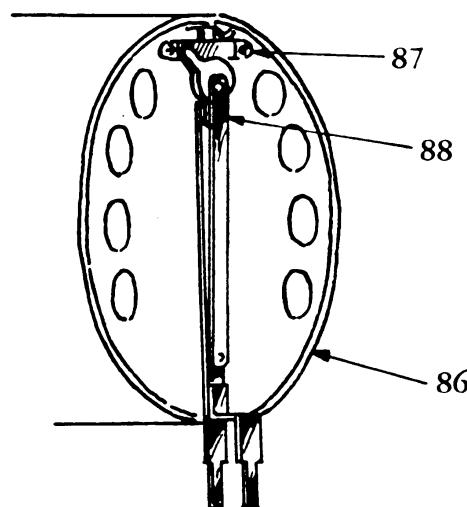
NOTE: The slot in bushing of this assembly must fit over pin in control lever assembly. Bimetal control assembly should be rotated until the slot and pin line up. Do not at any time use force in assembling these parts. To do so may injure them beyond repair.

27. HEATER ASSEMBLY (figs. 6, 7, 9, and 10).

- a.** To assemble heater proceed as follows:
 - (1) Fasten sump assembly (13) to lower housing assembly (44) by means of two screws and lockwashers (31).
 - (2) Insert combustion drum assembly into lower housing assembly (44) and fasten loosely using four screws and lockwashers. These four screws should be located in the screw holes at each end of combustion drum.

NOTE: The ends of control lever assembly located on rear end of combustion drum must protrude through slots in bottom of lower housing assembly (44).

- (3) Fasten porcelain bushing (82) in place with a $1\frac{1}{2}$ -inch pipe locknut.
- (4) Place one ring (42) in position nearest fan.
- (5) Fasten fan assembly (81) in place with four screws and lockwashers.



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Figure 16. Thermostat control lever assembly.

- (6) Place other ring (42) in position at end of lower housing assembly (44).
- (7) Place top housing cover (41) in position.
- (8) Insert two screws through top housing cover, lower housing cover and rear motor strap (43) and fasten with two nuts and lockwashers.
- (9) Using two screws and lockwashers, securely fasten the two rings (42) to the top cover.

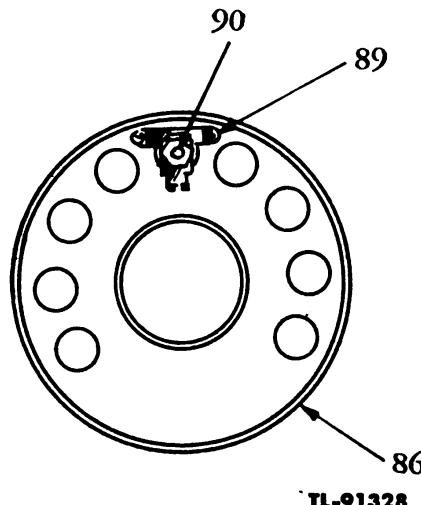


Figure 17. Bimetal control assembly.

- (10) Loosely fasten the top housing cover and lower housing cover together by means of six screws and lockwashers, making sure the three lighter hooks (83) are in the position as shown in figs. 9 and 10.
- (11) Place fuel tank (37) in position, making sure fuel-fill opening is at the rear of heater. Fasten with four nuts (36). Tighten nuts evenly by tightening across corners.
- (12) Fasten lighter door spring (35) in place with two screws and lockwashers.
- (13) Tighten securely all screws holding top housing cover and lower housing cover together.
- (14) Insert lighter door assembly (33) into place and fasten with two screws and lockwashers (32).
- (15) Loosely fasten housing ring (47) to burner housing with four screws and lockwashers (46).
- (16) Insert safety shut-off switch (84) into burner housing and fasten with four screws and lockwashers (45).
- (17) Insert burner assembly into burner housing (85) making sure tongue on safety shut-off switch fits into notch on lever on top of float chamber.

- (18) Insert two studs (22) into place and fasten loosely.
- (19) Insert two screws (23) into place and fasten loosely.
- (20) Tighten securely the two screws (23) and the two studs (22).
- (21) Place burner housing cover (21) in position, and fasten securely with four screws and lockwashers (20).
- (22) Tighten securely the other four screws (46) holding housing ring (47) to burner housing (85).
- (23) Attach swivel pivot (91) to end of bimetal control assembly (90).
- (24) Attach swivel shaft (92) to swivel pivot (91).
- (25) Place heater nose (39) on end of heater making sure swivel shaft goes through bushing.

NOTE: When inserting swivel shaft, which is slotted, through thermostat bushing with pin through center, turn thermostat adjusting lever to No. 3 or upright position (fig. 5). Turn swivel shaft to the right until a slight tension is felt on shaft. At this point the slot in the swivel shaft should be in the upright position. Push heater nose on heater making sure slot in swivel shaft connects with pin in bushing. This adjustment must be made when heater is at room temperature.

- (26) Fasten heater nose (39) to heater by using four sheet-metal screws (38).
- (27) Insert stack assembly (2) into stack opening.
- (28) Insert motor switch (10) into place and fasten securely.
- (29) Wire motor, switch, and extension cord (fig. 15).
- (30) Connect and fasten fuel line (27) from right-hand side of tank to sump.
- (31) Connect and fasten fuel line (19) from sump to float chamber.
- (32) Connect and fasten fuel line (28) from left-hand side of tank to sump.

b. The heater is now completely assembled and should operate normally if the procedures outlined for the assembly of its various subassemblies (pars. 17 to 26) have been properly accomplished.

28. BURNER FAILS TO GET FUEL.

a. If burner fails to get fuel proceed as follows:

- (1) Check fuel tank and make sure there is sufficient fuel in tank.
- (2) Check main shut-off valve lever (6) making sure it is in the open position.
- (3) Check metering valve lever (9) and make sure it is in the raised position.

b. If there still is no fuel getting to burner after checking the above parts, proceed as follows:

- (1) Loosen nut (18) on fuel line at float chamber. If fuel leaks out from this fitting, then the fuel line to float chamber is clear and the

trouble must lie between this fitting and the burner. Tighten nut (18) to prevent any more fuel leaking out.

(2) Check metering valve (63) to make sure it raises to open position when lever [fig. 4 (9)] is raised. If it does not raise, it may be loosened by tapping slightly on side of float chamber.

c. If this does not loosen metering valve:

- (1) Remove burner from heater [par. 16a(1) to (6)].
- (2) Remove cover from float chamber (par. 19a to e).
- (3) Check metering valve. Clean metering valve (par 19f).
- (4) Clean metering-valve seat.
- (5) Check inlet needle valve for dirt or other obstructions (par. 19i and j).
- (6) Check inlet needle valve seat. Clean inlet needle valve seat (par. 19m and 19n).

29. BURNER GOES OUT. If burner goes out after being in operation:

- a. Check to make sure whether stack plug (3) (fig. 4) or diffuser plug (5) (fig. 6) is in the open position.
- b. Check safety shut-off to make sure it is in the correct position (par. 12a and b).
- c. Check motor and fan to make sure they are operating.
- d. Check vent hole in fuel-tank cap to make sure it is clear.

30. MOTOR AND FAN DO NOT OPERATE. If motor and fan do not operate, proceed as follows:

- a. Check motor switch to make sure it is in the ON position.
- b. Check battery clamps to make sure they are connected and making good contact.
- c. Check batteries to make sure that they are NOT DEAD or very weak.
- d. Rotate fan blades counterclockwise. The motor shaft may be stiff. Rotating the fan will break the tension on the motor shaft and will allow motor shaft to rotate under its own power.
- e. If motor still does not operate, check wiring for breaks or corrosion.
- f. If all of above are operating normally, remove motor switch and replace with a new switch.
- g. If after checking all of the preceding points and making sure that all parts are functioning properly the motor still fails to operate, remove motor and replace with a new motor.

31. MOISTUREPROOFING AND FUNGIPROOFING. Moistureproofing and fungiproofing will not be required for this equipment.

SECTION V
SUPPLEMENTARY DATA

32. MAINTENANCE PARTS LIST FOR MILLER UTILITY HEATER OG-31-A.

NOTE: Order maintenance parts by stock number, name, and description.

Only maintenance parts listed can be requisitioned.

a. Blower Group.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
81	3H3100A04-5	MOTOR: electric; d-c; Redmond Co., No. 705 Model H.	1			*			*
	3H3100A04-5/B5	BRUSH ASSEMBLY: electric fan drive motor; d-c.	2		*	*			*
11	3Z1086B-1	CLIP: battery cable; for connection to storage battery terminal.	2		*	*			*
10	3Z9857.48	SWITCH: toggle; (single-pole, single-throw; 115-volt); Arrow-Hart and Hegeman 20994-EY.	1		*				*

b. Burner and Float Bowl Group.

	6Z5058-1A.1/B1	BURNER: assembly; consists of Miller Co. No. H-2146-A burner assembly and Miller Co. No. H-2144-A burner control assembly.	1			*			*
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* Indicates stock available.

32. MAINTENANCE PARTS LIST FOR MILLER UTILITY HEATER OG-31-A. (contd.)

NOTE: Order maintenance parts by stock number, name, and description.
Only maintenance parts listed can be requisitioned.

b. Burner and Float Bowl Group (contd.)

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
90	6Z5058-1A.1/T1	CONTROL: thermostat; assembly; Miller Co. No. H-2147-A.	1		*				*
72	3H1901-A/G5	GASKET: float needle valve seat; Briggs & Stratton Corp. No. 68877; Miller Co. No. 20830-A.	1		*				*
77	6Z5058-1A.1/G1	GASKET: sump bowl; Miller Co. No. E-1069-A.	1		*	*			*
17	6L3108-32-3	NUT: low-fire adjustment; special; Miller Co. No. A-1964-A.	1		*	*			*
70	6L4302-1-1	RIVET: steel; roundhead; tubular.	1		*	*			*
15	6Z5058-1A.1/S1	SCREW: high-fire adjustment; brass; No. 10-32 thread; National Coarse.	1		*	*			*
23	6L20910-4-1.81	SCREW: burner cover mounting; steel; special; No. 10-24 thread; National Coarse.	2		*				*

* Indicates stock available.

32. MAINTENANCE PARTS LIST FOR MILLER UTILITY HEATER OG-31-A. (contd.)

NOTE: Order maintenance parts by stock number, name, and description.
Only maintenance parts listed can be requisitioned.

b. Burner and Float Bowl Group (contd.)

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
71	6Z5058-1A.1/S4	SEAT: needle valve, float; Briggs & Stratton Corp. No. 99662; Miller Co. No. A-1909-A.	1		*	*			*
64	6Z5058-1A.1/S7	SPRING: metering valve; steel; Miller Co. No. E-855-A.	1		*	*			*
22	6L31108	STUD: steel; special; Miller Co. No. A-1922-A.	2		*	*			*
63	6Z5058-1A.1/V1	VALVE: metering; brass; special; Miller Co. No. A-1965-A.	1		*	*			*
69	3H1901-AP/V5	VALVE: needle; float; Miller Co. No. A-1908-A; Briggs & Stratton Corp. No. 99621.	1		*				*

* Indicates stock available.

32. MAINTENANCE PARTS LIST FOR MILLER UTILITY HEATER OG-31-A. (contd.)

NOTE: Order maintenance parts by stock number, name, and description.
Only maintenance parts listed can be requisitioned.

c. Fuel Supply Group.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
74	6Z3430-13	COUPLING: fuel line to fuel tank; brass; Mueller Brass No. A-331.	2		*	*	*	*	*
	6Z7249-23	FITTING: fuel line; Mueller Brass No. A-141.	6		*	*	*	*	*
78	6L20910-14.93	SCREW: sump cup holding; special; steel; flathead; Miller Co. E-1081-A.	1		*	*	*	*	*
	6Z5058-1A.1/S10	STRAINER: sump bowl; Miller Co. No. E-1070-A.	1		*	*	*	*	*
	6Z3323-5	TUBING: copper; for fuel lines; 5/16" outside diameter x 15' long; to be used as a stock length.							
75	6Z5058-1A.1/W1	WIRE: sump bowl retaining; steel; Miller Co. H-2080-A.	1		*	*	*	*	*

* Indicates stock available.

32. MAINTENANCE PARTS LIST FOR MILLER UTILITY HEATER OG-31-A. (contd.)

NOTE: Order maintenance parts by stock number, name, and description.
Only maintenance parts listed can be requisitioned.

d. General.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	6L18208-4.8P	SCREW: sheet metal; steel; No. 8 x $\frac{1}{4}$ "; binding heads; Parker-Kalon types A or Z.	6		*				*
38	6L7946-6.11S	SCREW: sheet metal; Steel No. 6 x $\frac{3}{8}$ "; binding head; Parker-Kalon types A or Z.	4		*				*
67	6L6540-4.1	SCREW: machine; steel; round head; No. 5 x 40 x $\frac{1}{4}$ ".	2		*				*
50	6L6832-36.1S	SCREW: machine; steel; round head; No. 8 x 32.	3		*				*

* Indicates stock available.

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